MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

PES 0024 – ESSENTIAL STATISTICS
(All sections / Groups)

9 MARCH 2017
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of SIX **printed** pages excluding cover page.

2. Attempt **ALL** FOUR questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.

4. **Formula** is provided at the back of the question paper.

5. **Books for Statistical Tables** is provided.

Question 1 (25 marks)

(a)   The following data give the annual earnings (in thousands of dollars) before taxes for 8 households selected from 1990 Interview Survey. These households were selected from those who had positive earnings.

<div align="center">

11   43   92   42   46   56   25   44

</div>

Assuming that these are sample data, calculate the following (leave your results correct to 2 decimal places, where appropriate):

(i)   Mean   **(3 marks)**

(ii)   Median   **(3 marks)**

(iii)   Mode   **(1 mark)**

(iv)   Standard Deviation   **(5 marks)**

(v)   Range   **(2 marks)**

(b)   The ages of secretaries at the McNair Company are as follows:

<div align="center">

26   27   25   27   27   18   27   26   33   27

34   20   28   21   20   29   35   26   24   28

</div>

(i)   Construct a frequency distribution table for these data using four classes (18-22, 23-27, 28-32, 33-37). Then determine the percentage frequency distribution together with the cumulative frequency for each class.

(6 marks)

(ii)   Interpret the percent frequency for class with age 28-32 using the table in (i).   **(2 marks)**

(iii)   Interpret the cumulative percent frequency for class with age 28-32 using the table in (i).   **(2 marks)**

(iv)   State the type of data collected by the the McNair Company

(1 mark)

Continued...

Question 2 (25 marks)

(a)   A newspaper company runs a survey and collects the following data:

- 41 people liked the headlines
- 33 people liked the editorials
- 36 people liked the sports coverage
- 14 people liked the headlines and the sports coverage
- 9 people liked the editorials and the sports coverage, but not the headlines
- 8 people liked the headlines and the sports coverage, but not the editorials
- 12 people liked the headlines and neither of the other two coverages
- 20 people didn't like any of the coverage

Let H be the event of headlines, E for editorials, and S for sports coverage.

(i)   Represent the above information in a Venn diagram.   **(4 marks)**

(ii)   How many people liked headlines or sports coverage but did not like editorials?   **(2 marks)**

(iii) If one person is selected, what is the probability that the person did not like headlines?   **(2 marks)**

(iv)   If a person liked sports coverage, what is the probability that the person also liked editorials?   **(2 marks)**

(b)   The proportion of people who respond to a certain mail-order solicitation is a continuous random variable X that has the density function

$$f(x) = \begin{cases} \dfrac{2(x+2)}{5} & , \quad 0 < x < 1 \\[2em] 0 & , \quad \text{otherwise} \end{cases}$$

(i)   Show that the function $f(x)$ is a valid probability function.   **(4 marks)**

(ii)   Find the probability that more than $\frac{1}{4}$ but fewer than $\frac{1}{2}$ of the people contacted will respond to this type of solicitation.   **(4 marks)**

(iii) Calculate the standard deviation of $f(x)$.   **(7 marks)**

Continued…

Question 3 (25 marks)

(a)   The packaging process in a breakfast cereal company has been adjusted so that an average of $\mu = 13.0$ oz of cereal is placed in each package. The standard deviation of the actual net weight is 2.0 oz, and the distribution of weight is known to follow the normal probability distribution. Determine the probability that a randomly chosen package will contain:
(Hint: Sketch a normal distribution curve)

    (i)   less than 10 oz?   **(4 marks)**

    (ii)   at least 15 oz?   **(4 marks)**

    (iii)   between 10 and 15 oz?   **(5 marks)**

(b)   Using the Binomial probability table, find the following probabilities.

    (i) $P(X = 0)$ for $n = 9$ and $p = 0.4$ **(1 mark)**

    (ii)   The leading brand of dishwasher detergent has a 30% market share. A sample of 20 detergent customers was taken. Using the Binomial probability table, find the following probabilities.

        a.   What is the probability that 3 or more customers chose the leading brand?   **(3 marks)**

        b.   What is the mean and standard deviation of this distribution?
                                                                                          (2 marks)

(c)   The probability that a student pilot passes the written test for a private pilot's license is 0.7. Find the probability that a given student will pass the test on the third try?   **(2 marks)**

(d)   On average, a textbook author makes two word-processing errors per page on the first draft of her text-book. What is the probability that on the next page she will make:
    (i)   3 or more errors?   **(3 marks)**
    (ii)   no errors?   **(1mark)**

Continued...

Question 4 (25 marks)

(a)   A survey was conducted to determine the costs of holidays at Holiday Inn Resorts. Total of 164 individuals were randomly sampled. Each was asked to assess the total cost of his or her most recent holiday at Holiday Inn Resorts. The average cost was $1386 and the standard deviation was $400.

    (i)   Find the point estimate of the mean total cost at Holiday Inn Resorts

(1 mark)

    (ii)   Construct a 90% confidence interval estimation of the population mean cost of holidays.   **(3 marks)**

    (iii)   A customer claimed that he had spend $1500. Comment on this customer's claim as per the results calculated in (ii).   **(2 marks)**

    (iv)   Construct a 95% confidence interval estimate. How does this change the claim in (c)?   **(5 marks)**

(b)   Research traffic departments doing basic survey of traffic accidents on selected weekdays occur at a certain intersection. Given the number of accidents occur on the following days.

Days	Number of accidents
Monday	3
Tuesday	2
Wednesday	1
Thursday	4
Friday	1

List all the possible samples of three selected days (without replacement) from this population and construct the sampling distribution of the sample mean.

(14 marks)

End of Page

Formula Sheet

Descriptive Statistics

	Population	**Sample**

Ungrouped Data

Mean

$$\mu = \frac{\sum x}{N} \qquad \bar{x} = \frac{\sum x}{n}$$

Variance

$$\sigma^2 = \frac{\sum (x - \mu)^2}{N} \qquad s^2 = \frac{\sum (x - \bar{x})^2}{n-1}$$

OR

$$\sigma^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N} \qquad s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$$

Standard Deviation

$$\sigma = \sqrt{\sigma^2} \qquad s = \sqrt{s^2}$$

Grouped data

Mean

$$\mu = \frac{\sum fm}{N} \qquad \bar{x} = \frac{\sum fm}{n}$$

Variance

$$\sigma^2 = \frac{\sum f(m - \mu)^2}{N} \qquad s^2 = \frac{\sum f(m - \bar{x})^2}{n-1}$$

OR

$$\sigma^2 = \frac{\sum fm^2 - \frac{(\sum fm)^2}{N}}{N} \qquad s^2 = \frac{\sum fm^2 - \frac{(\sum fm)^2}{n}}{n-1}$$

Standard Deviation

$$\sigma = \sqrt{\sigma^2} \qquad s = \sqrt{s^2}$$

Median

$$\frac{(n+1)^{th}}{2} \text{ observation of data}$$

Probability Distributions

Discrete

Binomial Distribution $\qquad \mu = np \qquad\qquad\qquad \sigma = \sqrt{npq}$

Continuous

Normal Distribution $\qquad z = \dfrac{x - \mu}{\sigma}$

Sampling Distributions

Mean $\qquad \mu_{\bar{x}} = \mu$

Standard Deviation $\qquad \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

Estimation

Confidence Interval $\qquad \bar{x} \pm z_{\alpha/2} \dfrac{\sigma}{\sqrt{n}}$